November 3, 2004

Science Mission Directorate
National Aeronautics and Space Administration
Washington, DC

Dear Colleagues:

Recently NASA has begun the transformation of its Earth and space science programs by combining them into an integrated Science Mission Directorate. The new Directorate will be closely involved in the Vision for Space Exploration through its support of science that both enables, and is enabled by, NASA's exploration activities. More information on the Vision for Space Exploration may be found at http://www.nasa.gov/missions/solarsystem/explore_main.html.

We are seeking input from the science community in developing a set of research focus areas for interdisciplinary scientific investigations in support of the Vision for Space Exploration. We seek your suggestions on how to develop interdisciplinary lines of scientific inquiry that could connect the goals of the Vision for Space Exploration to ongoing, but more narrowly focused, scientific activities within Earth system science, planetary sciences, astrophysics, and solar physics. We will include such interdisciplinary research focus areas in our January 2005 omnibus solicitation for research and analysis, with proposals due in mid-2005, although we recognize that reaching closure on this topic may require additional time and thought. We will also hold a pre-proposal workshop in Spring 2005 to discuss exploration-related interdisciplinary research focus areas.

One specific goal of the Vision for Space Exploration is the scientific investigation of the Earth, Moon, Mars and beyond with emphasis on understanding the history of the solar system, searching for evidence of habitats for life on Mars, and preparing for future human exploration. We seek your input on establishing interdisciplinary scientific research focus areas that promote our understanding of the formation of diverse terrestrial planets (with atmospheres) in our solar system, as well as those beyond. One example might be collisional processes. How have collisional processes played a role at differing time and spatial scales within our solar system in creating such a diverse and yet related set of terrestrial planets, with unique atmospheres? Could the diversity of terrestrial planets be purely a product of stochastic processes? What shaped the biological systems on Earth during the last few billion years of planetary history?

A second example might be markers available for study on other planetary bodies (including, but not limited to, the Moon and Mars) that may provide information about the evolutionary history of that body in the context of how it is affected by its broader environment. Are there Martian analogues to terrestrial ice cores that may provide insight into the prior climate of the Martian system? Are there markers in dust on the Moon? And, to the extent there are surfaces on other solar system bodies like Europa, what signals may be buried in there? How might such variations get transmitted through the planetary environment and frozen in time?

Another goal of the Vision for Space Exploration is the conduct of advanced telescopic searches for Earth-like planets and habitable environments around other stars. We seek your input on establishing interdisciplinary scientific research focus areas with the goal of developing effective astronomically detectable signatures of biological processes. One example might be the definition of such biosignatures. Can the study of the Earth as a system identify atmospheric biosignatures that can distinguish Earth- like (and potentially habitable) planets around nearby stars? Can an understanding of the origin of life, and the time evolution of our own atmosphere on Earth reveal likely signatures of life on extrasolar planets? What are the most effective search strategies for detecting atmospheric biosignatures on planets orbiting distant stars of various properties?

A third goal of the Vision for Space Exploration is to explore the solar system for scientific purposes and to support human exploration in order to ultimately establish a sustained “presence” throughout the solar system. We seek your input on establishing interdisciplinary scientific research focus areas in order to develop diagnostic and predictive methods and models for assessing the state and conditions of the interplanetary medium in support of safe human travel and a sustained presence by both robots and humans. One example might be the fundamental physical mechanisms that cause largescale coronal mass ejections from the Sun and exert a profound influence on the interplanetary medium. NASA is exploring various observational vantage points via robotic spacecraft to increase knowledge in this arena (e.g. STEREO, Solar Dynamics Observatory, perhaps Solar Probe). Such mass ejections produce a large flux of solar proton events of potentially lethal consequence to improperly shielded human flight systems, as well as some types of robotic systems. What interdisciplinary research focus areas involving fundamental physics, modeling, and observations could lead to improved systems engineering decision-making?

In addition to using your input to develop a solicitation for scientific research and analysis, we intend to hold a pre-proposal workshop at a suitable time in early 2005 to continue this dialogue. Through your input in response to this letter, through the dialogues that are developed at the 2005 and subsequent workshops, and through the research investigations that are selected in response to a solicitation, a full suite of interdisciplinary science activities can be included within the agenda of the Vision for Space Exploration.

Your input on the subject of interdisciplinary research focus areas supporting the Vision for Space Exploration would be most helpful if they are received by Friday, December 10, 2004. Your input, in the form of a white paper of 2 pages or less, should be sent to the address below. It would also be helpful if you send an electronic copy of your white paper to the e-mail address given below.

Thank you for your interest in NASA's science and exploration programs.

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